MISSION OPERATIONS DIRECTORATE
FLIGHT DIRECTOR OFFICE

STS-106/ISS INCREMENT OPERATIONS
MISSION OPERATIONS

FLIGHT READINESS REVIEW

August 29, 2000

DA8/J. W. BANTLE

STS-106/Increment Operations

- STS-106 Mission Operations
  - Significant Items/Mission Firsts
  - Network
  - USA Flight Operations
  - MOD
- Flight Rules
  - Generic - Volume A
  - Flight Specific
- Standard Special Topics
  - STS-106 Ascent Performance
  - STS-106 Abort Regions
  - STS-106 Nominal ET Impact Area
- Certification
- Readiness Statement

STS-106 Significant Items/Mission Firsts

- Shuttle – A/E
  - A/C Bus Sensors – Use Auto trip for entry (remains in monitor for ascent
    - AEFTP review of failure history, reliability, and failure modes
    - Flight Rule Update – Annex PCN (open work)
  - Use of Le Tube Air Base (Istres, France) as an Ascent ELS
    - Ops prepared to uplink in OPS 3, if required
  - Update to Launch Window philosophy – open at optimum (flight rule update – annex PCN – open work)
  - Contingency Landings with GPS – weather minimums (flight rule update – in work)
  - FCS Checkout update (perform sec actuator check twice) due to STS-101 Speedbrake Channel 3 bypass delay during FCS C/O
  - Postlanding Updates to mitigate impacts to turnaround processing in cases where SSME repositioning cannot be performed at KSC (manual positioning of bodyflap, deletion of turnaround position, new SB repos.)
  - Tracking test plan for White Sands (checkout radars) during orbit phase

STS-106 Significant Items/Mission Firsts

- Shuttle – Orbit
  - Ku-Band Radiation during RF Protect box (STS-101). Rule and ground procedure to prohibit KU transmission during fast slew (TDRSS handovers and acquisitions)
  - SM Solar Arrays are required to be fixed during EVA
  - 1st docking to ISS with SM present – auto MCS moding available
    - MCC-M will backup moding (ground command) at capture +40 sec (protects 65 sec constraint)
    - Docking window definition – two-pane concept with cutout for site handover (30 sec LOS) to ensure verification of ISS status on one site
  - Space-to-Space Comm System for EVA – potential for comm dropouts when no line of sight between EMU radio and Orb ant. Rules Update:
    - Two-way comm required between EV crew member and orbiter at all times
    - Allow an EV crew member to work in areas of comm blockage if continuous monitoring of safety inhibits is not required and other EV crew member positioned for comm relay

STS-106 Significant Items/Mission Firsts

- Shuttle – Orbit (cont'd)
  - Hydrazine Detection
    - Current rules & procedures assume use of Drager tubes in the event of potential exposure
    - Recent WSTF testing raised questions regarding Drager tube accuracy – ground processing and ammonia interface
    - Ops workarounds developed to use Drager tubes for near-term missions
      - Ground processing/contamination – fly twice as many Drager tubes
      - Ammonia interface – if EMU contamination suspected or confirmed, repress A/L using N2 directly from supply tanks via N2 resupply lines
      - Other accuracy concerns – analysis of current cabin atmosphere scrubbing protects for twice as much contamination as Drager tube minimum sensitivity (i.e., covers for 100% uncertainty)
    - Longer term work is ongoing to eventually replace Drager tubes with a better technology (e.g., gold salt)

STS-106 Significant Items/Mission Firsts

- Station
  - USOS Open Anomalies
    - CBM Bolt Load Error Anomaly – checkout of Node 1 Zenith and Nadir CBM's planned for STS-106
    - Port and Starboard Omni antennas – will not use omni antennas until vendor failure analysis of port antenna is complete (failed port R&R'd on STS-101, degraded starboard on orbit)
  - RSOS Open Anomalies – FGB
    - FGB PTAB 1 Anomaly (current sensor, temp.)
    - FGB Smoke Detectors 1, 3, 4, and 5
    - FGB ZRU 6 MIRT Sensor Anomaly (instrumentation only)
  - RSOS Open Anomalies – SM
    - STAR Mapper #3 (req. ground reset)
    - SM Computer – CPU usage – required a reboot
    - SM Docking Target – not deployed
    - OXIDIZER Transfer Anomaly (compressor #3)

STS-106 Significant Items/Mission Firsts

- Station (cont'd)
  - FOR Open Actions
    - Provide procedures for removal and reinstallation of progress docking probe – RSC-E/Tsygankov, DO/Pruzin
  - Lack of SM closeout photos
    - Crew will be taking video after ingress
    - Concerns
      - Additional Russian items stowed in planned 2A.2B stowage
      - Potential interference with Orlan 1/mounting with panel 121 (ergometer installation)

STS-106 Significant Items/Mission Firsts

- Ground/MCC
  - First flight using Europa Baseline
  - IPS software release
  - MOC software release
  - ODRC (data retrieval) software release
  - DVIS (voice system) software release
  - Advanced Weather System Interactive Processing System (AWIPS) installed
  - Temporary CSR

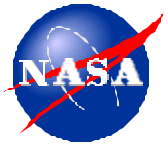
STS-106 ISS 2A.2B Flight Readiness Review

Networks

Agenda

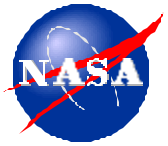
- STS-101 Anomalies
- Flight Activity
- TDRSS Constellation
- Significant Changes
- STS-106 Preparation Issues
- Configuration Management
- Critical Periods

Ted Sobchak
Network Director
GSFC/Code 450
August 29, 2000



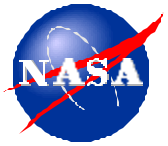
STS-101 Anomalies

- **Pre-Launch Support**
  - **Experienced intermittent command drops from JSC during the STS-101 TCDT on April 7**
  - **Two unrelated problems were the cause**
    - **Prime Command Path via Terrestrial Circuit isolated to the carrier**
      - **Carrier reluctant to perform repair work outside of planned maintenance hours, prolonged the outage during TCDT activities**
      - **Corrective Action: Reinforcement of processes for notification to carriers and escalation of outage restoral; carrier soft failure reroute tested.**
    - **Redundant Command Path Circuit issue isolated to KSC internal switching system**
      - **Caused by low signal levels due to misconfigured switch setting**
      - **Corrective Action: Configuration Procedures reviewed and an alternate path through KSC has been identified**



STS-101 Anomalies (con't)

- **Launch Countdown**
  - **Second Launch Attempt (March 2000)**
    - **PDL data lost at T-55 minutes when a PDL bit sync failed to relock on MIL data after switching to high power**
      - **Procedures modified to include an operator check of the bit sync status following the switch to high power**
    - **WLPS test data was erroneously identified with MIL source code causing loss of MIL data at JSC and SKR data to KSC**
      - **MIL setup procedures modified to default WLPS data with the PDL source code**
  - **Third Launch Attempt (March 2000)**
    - **MIL DQM subsystem software crashed several times effecting Best Source Select (BSS) switching**
      - **Software fix delivered and tested**



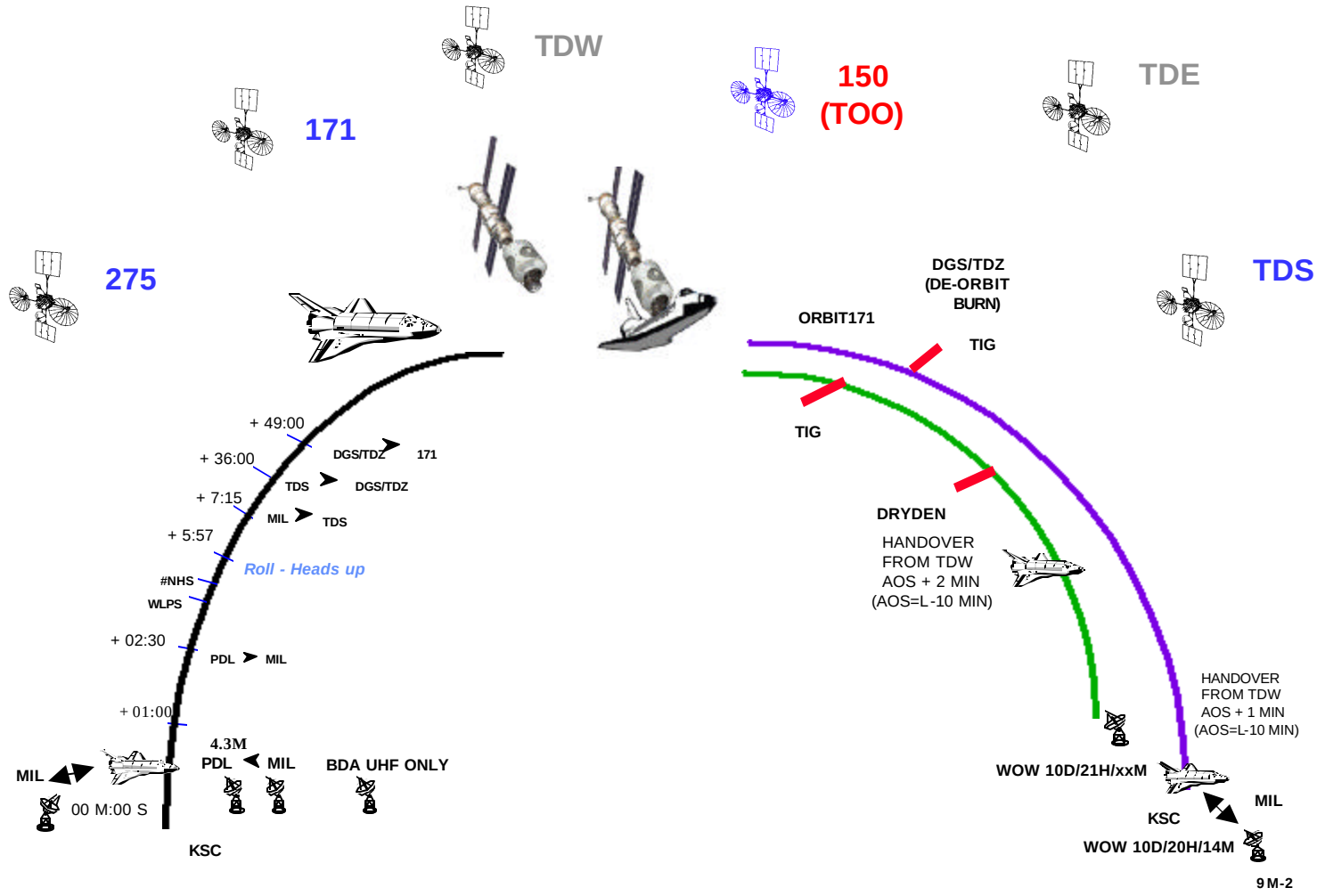
STS-101 Anomalies (con't)

- **L-1 Day Checks**
  - **MIL receiver did not automatically switch from TDRS to STDN mode when Shuttle switched**
    - **Known software discrepancy**
      - **Corrective workaround not properly documented**
    - **Software corrected to prevent future occurrence**

ISS Support Anomaly

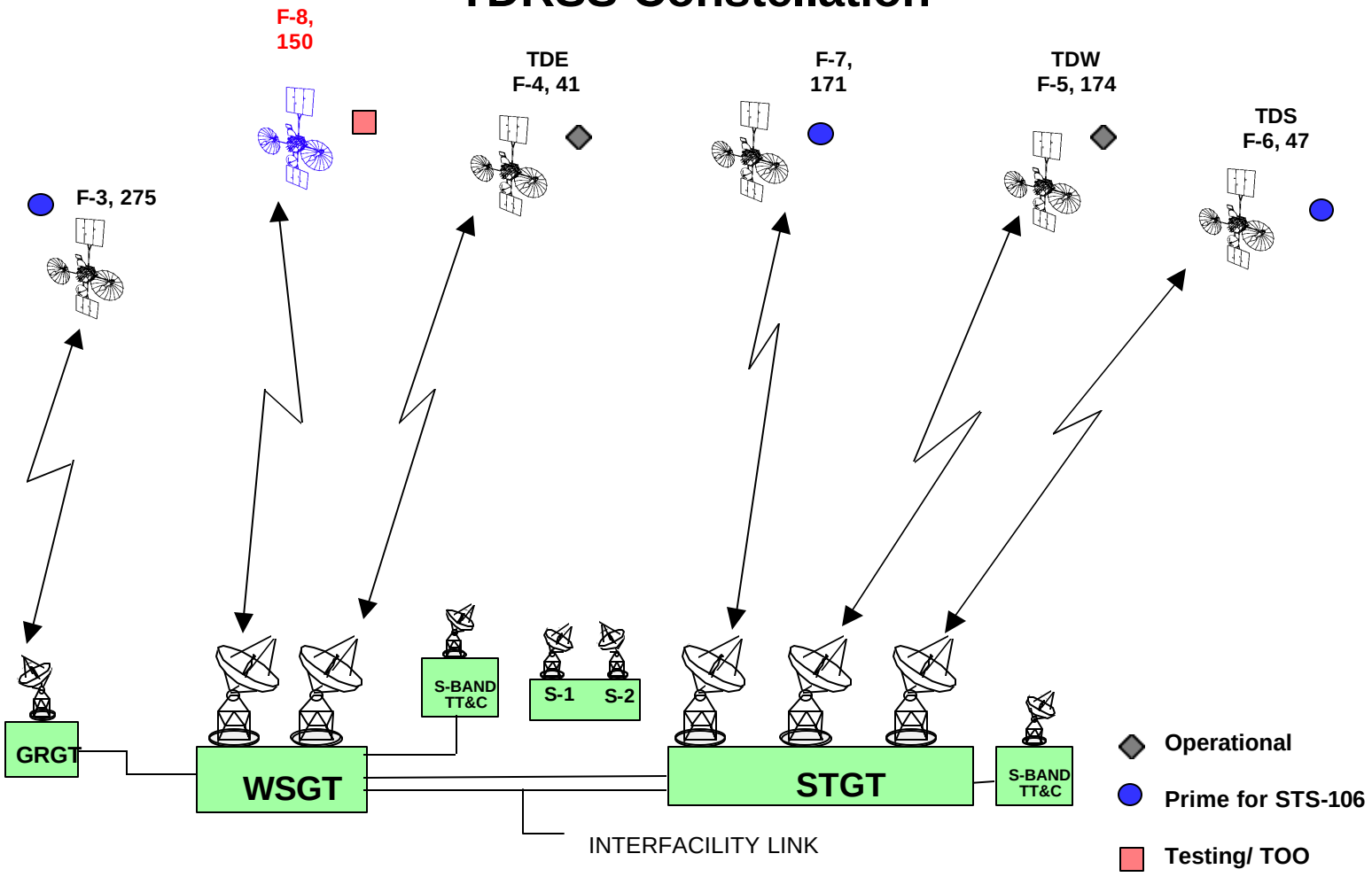
- **Corrupted TDRS acquisition data caused by improperly configured powered flight profile for another user (July 31)**
- **Corrective Action: A prime and backup acquisition data generation system will be dedicated to support ISS and Shuttle**

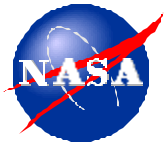
STS-106 FRR
Mission Services



STS-106 FRR
Mission Services

TDRSS Constellation





Significant Changes (Space Network)

TDRS-H (F-8)

- **Launched June 30, 2000 on an Atlas IIA**
- **Spacecraft at 150^0W (July 15, 2000)**
  - **Acceptance and Post-Acceptance testing at 150^0W through late September to include verification with JSC/ESTL on August 29**
  - **F-8 will be co-located with the F-7 spacecraft at 171^0W and used for ISS and Shuttle early 2001**
  - **Target of Opportunity (TOO) passes are scheduled with Shuttle during crew sleep periods**
  - **TOO passes will be scheduled with ISS after STS-106**

Significant Changes (DSMC)

- The Data Systems Management Center (DSMC) consolidates GN and SN near term mission planning, real-time console operations, scheduling, service accounting, and test functions at WSC
- Implemented through a series of physical relocations, system enhancements, and personnel movements which will enable functional and organizational consolidations
- Scheduled to be complete in September 2002
- The services provided to SN and GN customers do not change
- Major Activities :
  - Realtime Ops interface functions will transfer after “GO” for on orbit operations from NCC Ops to WSC Ops
  - Realtime Ops interface functions were transferred for ISS support on July 18

Significant Changes (NISN)

- **Small Conversion Device (SCD) 5.0 Transition**
  - **The SCD 5.0 software was delivered to network IP conversion devices. As a result of this delivery, software maintenance will be transferred from the PTP vendor to NASA control**
  - **JSC**
    - **Supported STS-99 launch count and GN L-1 day checks in a shadow mode to validate new software. Final delivery was on June 21.**
  - **MSFC**
    - **Supported STS-103 and 99 with SCD 5.0 in shadow mode. Final delivery was on June 21.**
  - **KSC**
    - **CD&SC used software for TCDT August 18-19.**
  - **GSFC, WPS, DFRC installations completed August 4.**
- **All sites plan to support the mission utilizing SCD 5.0 software**

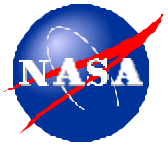
Significant Changes (NISN)

Russian Circuit Transition

- Planned configuration
  - Terminate circuits from Russia directly into JSC
- Advantages of new configuration
  - Automated failover and eliminates network complexity
- Key Milestones
  - Design Review — July 24, 2000
  - Circuit Turnover — August 28, 2000
  - Remove GSFC Connections and Equipment — October 3, 2000

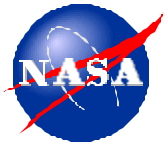
JSC MDM

- Modified firmware in JSC backup MDM will be tested on orbit for 960/1024 kbps lock times
- Firmware installed on August 7



Significant Changes (Ground Network)

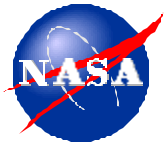
- **MIL**
  - **Software delivered to correct open discrepancy items**
    - **Installed, tested, and verified**
- **DFRC, WPS, WSC (VHF)**
  - **Ready to support SM VHF-1 voice checks if scheduled**
  - **Links identical to ISS Phase 1 MIR support**



Significant Changes (AFSCN/DFRC)

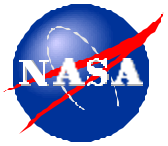
- **Air Force RTS**
  - **Will use TCS-B**
    - **TCS-A undergoing upgrades**
  - **VTS A and B have been upgraded to a Digital Recording System (Archival)**
  - **AFSCN Internal Comm Network is being upgraded to a 5 Mbps, ATM system**
    - **CTS interface operational**

- **Dryden Flight Research**
  - **Direct signal test inject capability installed for Telemetry and TV testing.**
  - **New Metrum (digital) recorders completed test and planned for support**
    - **Old recorders will be available as a back-up**



STS-106 Network Preparation Issues

- **MIL Network Command Processor System (NCPS) -2 experienced command verification errors during the TCDT on August 18.**
  - **Problem investigation continues.**
  - **NCPS-1 will be prime for command support.**
- **MIL Quad Helix UHF system struck by lightening on August 22.**
  - **Antenna controller is not functioning, repair completion date unknown**
  - **Plan to support using the Teltrac UHF system**



Configuration Management

- **Mission Freeze**
  - **An Integrated Networks freeze is planned for August 31**
  - **Exemptions must be approved prior to implementation.**
- **Critical Period Restrictions**
  - **Critical periods will be identified prior to the mission and documented in a "Mission Critical Periods ISI"**
  - **Maintenance and testing restrictions are imposed for all Network elements during mission critical periods.**

STS-106 FRR
Mission Services

Generic Shuttle/Station Critical Periods

EVENT	*START*	*STOP*
LAUNCH RENDEZVOUS MISSION	LAUNCH -4 HOURS	LAST RENDEZVOUS BURN ON FD1
LAUNCH NON-RENDEZVOUS MISSION	LAUNCH -4 HOURS	"GO FOR ORBIT OPS"
PAYLOAD DEPLOY	DEPLOY -3 HOURS	FINAL SEP BURN (+1 ORBIT DELAY)
RENDEZVOUS/DOCKING	2 HOURS PRIOR TO FIRST DAY OF RENDEZVOUS BURN (~CREW WAKEUP)	HATCH OPENING (+1 ORBIT DELAY FOR CONTINGENCY)
RENDEZVOUS GRAPPLE/RETRIEVE	2 HOURS PRIOR TO FIRST DAY OF RENDEZVOUS BURN (~CREW WAKEUP)	PAYLOAD BERTHING (+1 ORBIT DELAY FOR CONTINGENCY)
EVA	EVA EGRESS - 1 HOUR	EVA INGRESS + 1 HOUR
SELECTED ASSEMBLY/ ACTIVATION/CHECK-OUT TASKS	1 HOUR PRIOR TO START OF IDENTIFIED PERIOD SPECIFIED IN MISSION FLIGHT RULE ANNEX	+1 HOUR FROM TERMINATION OF IDENTIFIED PERIOD SPECIFIED IN MISSION FLIGHT RULE ANNEX
REBOOST OPS	3 HOURS PRIOR TO MANEUVER TO REBOOST ATTITUDE	150 MINUTES AFTER RETURN TO NOMINAL ATTITUDE
UNDOCKING	UNDOCKING - 3 HOURS	FINAL SEP BURN (+1 ORBIT DELAY)
LANDING	TD - 5 HOURS	WOW

IDENTIFIES CRITICAL PERIODS

Space Operations Management Office

Certificate Of Flight Projects Directorate Networks Readiness

This is to certify that with successful completion of flight readiness preparations and closure of associated action items, all integrated networks and CSOC elements are ready to support the STS-106/2A.2B - Spacehab

William F. Mack 8/4/00
W. Mack/NASA **Date**
Office of System Safety and Mission Assurance

Jon F Walker 8/4/00
J. Walker/NASA **Date**
Center Customer Commitment Manager

Hill S 8/4/00
D. Wagner/HTSI **Date**
GSFC CSOC Site Manager

T. Sobchak 8/4/00
T. Sobchak/NASA **Date**
Human Spaceflight Network Director

Stanton Norman 8/4/00
S. Norman/NASA **Date**
NISN Representative

for T. Sobchak 8/4/00
J. McKee/DRFC **Date**
Center Mission Services Manager

Space Operations Management Office

Certificate of Space Operations Management Office Readiness

Pending completion of flight readiness preparations, remaining standard work and closure of all action items, SOMO dedicated elements and all CSOC resources are ready to support the STS-106/2A.2B - Spacehab

Stan C. Newberry 8/9/00

S. C. Newberry **Date**
Director, Space Operations Management Office
Johnson Space Center

8/7/00

T. Sobchak/NASA **Date**
Human Spaceflight
Network Director

8/8/2000

D. Tighe **Date**
CSOC Program Manager

	Presenter: R. Gest
	Organization/Date: Flt Ops/08-29-00

STS-106/ISS 2A.2b
Flight Readiness Review

8/29/00

USA Flight Operations

United Space Alliance

AGENDA

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Requirements Compliance
- Facilities Readiness
- Flight Design Readiness
- Flight Preparation Product Readiness
- Training & Certification
- Flight Control Readiness
- Out of Family - None
- Special Topics - None
- CoFR Statement

REQUIREMENTS COMPLIANCE

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Requirements
  - SSP Requirements Documentation Summary
    - Flight Preparation Requirements Book (FPRB), Gen-BQ and 106-BASE-L
  - ISS Requirements Documentation Summary
    - IIDP, 0-FIN-R
  - Waivers & Exceptions
    - None
  - Significant non standard open work
    - None

FACILITIES READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Mission Control Center (MCC)
  - Significant Software Changes
    - MCC platform system software version Europa 4.2 released 8/18/00
      - Migrated to ISS operations 8/21/00
      - Fixed 47 CMD server AR's and included 13 top enhancements
    - ODRC software version 4.14 released 8/19/00
      - Fixes include data corrections for SAIL users
    - New DVIS software released 8/5/00
      - Added RFCR keysets including ISS CAPCOM ID
    - Remote Ops Conversion to Encrypted Data
      - 4 of 15 remote ops sites now encrypted
    - Significant Hardware Changes
      - OCA server move from C to A/B power
      - New circuit provides direct route between MCC-M and MCC-H for mission and administrative data (8/28/00)

FACILITIES READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Mission Control Center (MCC) - cont'd
  - Significant Anomalies - Dispositioned for flight - no IFAs
    - W/S LAN became unresponsive, command users could not communicate with servers
      - Caused by operator deviating from SOP of executing " find" command software script
      - Resulted in excessive LAN traffic, overloading the read/write server
      - Increased operator training implemented for correct command use
      - Investigating methods to make command error free
    - Command incorrectly remains armed after uplink
      - Ops note in place - manual unarm post uplink
      - Software fix in next baseline release (11/15/00)
    - All command users receive message to re-register when B/U command server is brought up after a select over was performed
      - Ops note in place to re-enable all users
      - B/U recovery is coordinated with flight control team

FACILITIES READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Mission Control Center (MCC) - cont'd
  - Significant Anomalies - Dispositioned for flight (cont'd)
    - STS-106 Sim OIU data observed in ISS FEP
      - OIU data immediately disabled
      - Procedures in place to prevent reoccurrence
    - ODIN PPL command could not be uplinked
      - Software error would not display all commands
      - Fix developed and released in EUROPA 4.2 delivery (8/21/00)
    - ROCC Abort switch failed during STS-106 TCDT
      - Intermittent problem - cause not yet identified
      - Tiger Team formed to address problem
      - Circuit checked at L-10 hrs, activated at L-5hrs
      - Additional technical support scheduled for STS-106 count to reset circuit if failure occurs - 30 minute return to operation

FACILITIES READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Mission Control Center (MCC) - cont'd
  - Facility Incidents - B30 MOW power outages affected MCC Voice Console and SPF systems due to Qwikswitch failures. A Qwikswitch is a solid state relay which provides power redundancy by automatically switching between two power sources (A1 and A2 power busses)
    - Three power outages (May 3 and twice on June 10)
    - 23 Qwikswitch failures in 16 slots (several repeats)
    - PowerCET retained as consultant on facility power quality and switch failures
      - Additional test instrumentation shipped in and installed
      - Two Qwikswitches shipped to PowerCET for analysis and test
  - Analysis Results
    - Switches failed due to short duration high current
    - Qwikswitches control logic is susceptible to both high frequency interference and PDU voltage sags

FACILITIES READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Mission Control Center (MCC) - cont'd
  - Analysis Results - cont'd
    - High frequency interference components recorded by test equipment on UPS output.
    - Out of phase busses (A1/A2) are a required condition for failure
      - A1 out of sync confirmed for May 3 event
      - A1 sync status not available for June 10 event
  - Analysis Conclusion
    - Observed Qwikswitch damage could result if coincident with both out of phase power input and uncommanded alternate source switching due to interference or PDU voltage sag
  - Flight Readiness Status
    - All actions required to assure flight readiness completed
    - B30 MOW PDU grounds moved to building steel
      - Reduces susceptibility to interference

FACILITIES READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Mission Control Center (MCC) - cont'd
  - Flight Readiness Status - cont'd
    - Qwikswitches in affected areas will be configured in a manual single source mode
      - Eliminates possible A1 to A2 short through Switch at the expense of power redundancy
      - Voice Console, DVIS, and SPF power on single source - power failure recovery procedures in place
  - Additional risk mitigation
    - Capacitors on A1/A2 UPS were approaching end of life
      - COD replaced capacitors (8/21/00)
    - All test and monitoring equipment will remain configured through flight
    - Adequate Qwikswitch spares are available
  - Long term action (Post STS-106)
    - Implement Qwikswitch design changes to enhance tolerance of potential interference and voltage sags
    - Upgrade UPS to mitigate the potential of A1/A2 out of phase condition

FACILITIES READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Significant non standard open work
  - Receive 2A.2b C&W PPL to be uplinked during mission
- Integrated Planning System (IPS)
  - Significant Software Changes
    - IPS application software 9.0 released 6/19/00
      - HSR release 8/15/00
      - 81 AR's fixed
  - Significant Hardware Changes
    - Installed six 384 MB W/S for TOPO support
    - Replaced three RPF W/S's
  - Significant Anomalies
    - None
  - Significant non standard open work - None
- Other USA accountable Flight Operations facilities are ready for mission support

FLIGHT DESIGN READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Design meets all NASA requirements (FDRD, FRD, etc..)
  - Limit exceedences- none
  - Entry thermal analysis complete - no violations
- All anomalies dispositioned
  - Significant anomaly reports - none
- Significant non standard open work -
  - Potential launch window redelivery due to ISS altitude change and/or phasing strategy

FLIGHT PREP PRODUCT READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Products
  - Shuttle consumables products - delivered or on schedule
  - Shuttle Flight Design I-load patches: Updates primarily due to Mission ID change and mass properties updates
  - All Shuttle Recon ARs & PARs have been closed
  - Significant non standard open work - none
- Procedures
  - FDF and ODF Status
    - No issues
    - Crew review on 8/22/00 and ship 9/1/00
    - Significant non standard open work - none

TRAINING & CERTIFICATION

Presenter: R. Gest

Organization/Date: Flt Ops/08-29-00

- Crew Training
  - Crew Training loading has been outside standard mission template
    - Standard Mission
      - 45 hrs per week L-3 through L-1
      - Personal prep time scheduled inside L-3 weeks
      - No new material content during Crew quarantine
    - STS-106/2A.2B
      - 60 hrs per week L-3 through L-1
      - No personal prep time available inside L-3 weeks
      - Proficiency EVA/NBL training during Crew quarantine
  - Flight specific Shuttle Crew Training Plan: All training has been or is scheduled to be completed prior to launch
- All Shuttle instructor and SMTF facility operations personnel are trained and certified

FLIGHT CONTROL READINESS

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- Real-time support software status
  - All user applications that support real-time Ops are certified and incorporated into the Ops baseline
  - Significant Anomaly Reports - none
  - Significant non standard open work - none
- Personnel
  - All USA flight controllers are certified for flight or are scheduled to be certified prior to flight
  - Significant non-standard open work - none

STS-106/ISS 2A.2b
Certification of Flight Readiness

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

- The USA Flight Operations FRR, NASA MOD FRR, and USA SFOC Pre-FRR have been completed.
- All Contractor Accountable Functions (CAF) have been completed, or are scheduled for completion, in accordance with NASA requirements and the applicable portions of the Space Flight Operations contract Flight Preparation Process Plan (NSTS 08117, section 8.5.18 and appendix “R”).
- All required products have been or are scheduled to be delivered per requirements.
- All Facilities have been configured and are ready for mission support.
- All CAF personnel are trained and certified or will be trained and certified prior to flight.
- Flight crew has been trained.
- There are no open issues.
- Pending completion of the defined open work.

USA FLIGHT OPERATIONS IS READY
TO SUPPORT THE STS 106/ISS 2A.2b MISSION

Original signed by Chuck Knarr

C.Knarr
Deputy Associate Program Manager, Flight Operations

Certification of Flight Readiness (CoFR) 2

Presenter:
R. Gest

Organization/Date:
Flt Ops/08-29-00

NSTS 50108 ENDORSEMENT CODE	USA FLT OPS SUB-ENDORSEMENTS
b. Requirements, design, and configuration changes have been dispositioned and the resulting hardware/software is ready to support the flight and on-orbit operations	b.1. Requirements have been implemented as defined in the IDRD and IIDP. b.2. Flight Operations accountable MCC and IPS critical and non critical user applications and associated CSOC accountable platform hardware and software are ready to support the flight and on-orbit operations. b.3. All Shuttle reconfiguration tasks required to support ISS operations are complete and ready for flight.
c. All sites, facilities, personnel, and procedures are ready to support the flight and on-orbit operations	c.1. MCC, IPS and Shuttle Instructor support personnel and procedures are ready to support the flight and on-orbit operations. c.2. All flight or mission unique MCC and IPS reconfiguration is complete and both facilities are ready for flight. c.3. The SMTF is configured and ready to support combined training operations in support of flight. c.4. The ODF/SODF has been managed and fabricated in accordance with the ODF and SODF Management Plans.
e. The mission support team and crew have completed training and are ready to support the flight and on-orbit operations	e.1. The MCC Operations Support Team and SODF flight controllers are trained, certified and ready to support the flight and on-orbit operations. e.2 All Shuttle crew training requirements required to support ISS operations have been completed.
g. All reported hardware/software problems and non-conformances have been resolved	g.1. All Flight Operations accountable anomaly reports have been dispositioned and are either closed or have operational work arounds in place for flight.
h. All operations requirements necessary for successful on-orbit operations have been defined and the planning for implementation has been completed	h.1. All Flt Ops and CSOC MCC and IPS flight and mission support planning is complete and ready for flight.

Pending completion of identified open work, USA Flight Operations is ready to support flight 2A.2b.

Original signed by Chuck Knarr

Deputy Associate Program Manager, Flight Operations

United Space Alliance

STS-106 Mission Operations - Significant Items

- Flight Software and Software Reconfiguration
  - Shuttle - No significant changes since STS-101
  - Station
    - Russian control vehicle patches (enable node MDM docking/moding signal to SM vs. FGB) – planned for 8/14
    - NCS 2.6.0 S/W (and associated PPL's) will be uplinked on FD 3 (~12 hour task)
- PCS
  - Early PCS 3A.024.1N (used on STS-101) used until NCS S/W update at which time we transition to 3A.024.2N
  - Four machines will fly (two with .1N and two with .2N), four hard drives, four backup CD's, and a recover CD/floppy kit (allows PCS rebuild if required). Two machines, two hard drives and recovery CD/floppy kit remain onboard ISS.
  - One printer to be stowed (awaiting Russian 28V cert – needed for 2R)

STS-106 Mission Operations - Significant Items

- Flight Design and Planning
  - ISS Flight Mechanics Design is complete and meets all requirements
  - Proper definition, insight, and review of shuttle flight design confirms ready for flight
  - To accomplish ISS “above the line” mission objectives requires FD 3 rendezvous option (11+2 day mission) (5 ingress days and 1 EVA day)
  - A number of additional objectives depend on gaining an additional energy dependent day
    - Launch opportunities ~50-70% of the time depending upon ISS altitude
    - To optimize FD 3 opportunities ISS reboost placeholder prior to STS-106
  - Prop margins require OMS assist buyback of at least ~900 lbs to be positive. Performance margin should support a buyback of ~3000 lbs (finalized at L-5 days).
  - Non-Prop (H2, O2, LIOH) margins support and 11+2 day mission. An additional energy dependent day may be possible for launch on time or 24 hr delay (24 hr delay may require Y-cable installation).

STS-106 Mission Operations - Significant Items

- Procedures: FDF and SODF
  - Shuttle – Significant Open Work:
    - Final RSA signoff on multi-element leak response
  - Station – Significant Open Work:
    - RODF publication in review by US
  - MOD Procedure Verification Review – Completed 8/15/00
- JOIP – Spacehab – Complete
- JOIP – US/Russian
  - Significant open work remains. Working group in Moscow ongoing.

STS-106 Mission Operations - Houston and Moscow Support Groups

- Several Product Updates (FGB Data Book, SM Data Book, SM Display Guide, and HSG Ops Handbook)
- HSG Staffing Plan (Support ready by 9/1)
  - 4 Ops Leads (2 certified, 2 OJT), 2 Russian Segment Specialists, 3 Ops Planner, 4 USOS Systems Specialists, 2 Ops Data File Specialists, 2 EVA Specialists
  - Consultant Team - Flight Director, Flight Activities Officer, Flight Dynamics & Trajectory Specialist
- MCC Consultant Group
  - Energia Team (6 people) was recalled (RSA funding) in early August
  - Krunichev Team (Flight Director, Training Specialist) remain in Houston but are in threat of being recalled

STS-106 Mission Operations - Crew and Flight Controller Training

- All crew standalone training has been completed/is scheduled to be completed prior to STS-106 launch
- EVA training ~95% complete. Training Ratio: >16:1 for prime crew, ~5:1 for backup EVA crew member.
- Additional NBL training runs were added late
- Integrated flight controller crew training has been completed
- All flight controller certifications are scheduled to be complete prior to launch.

Flight Rules Update – Volume A

- PCN-10 includes 57 flight rule CR's at 5 FRCB's. Approval at PRCB on 8/3
- Significant Changes
  - SSME Redline Sensor – addition of HPOTP and HPFTP discharge pressure sensors (due to recent pc discriminator logic changes made to SSME controller)
  - Iodine Removal Implementation with GIRA, LIRS (previously flown in annexes) (deletes requirement to re-install for D/O wave-off days)
  - MED's Rule Updates (mission duration requirements, IFM guidelines)
  - On-orbit supply water tank management (previously flown in annexes). Reflects phase I techniques. Allows Tanks A & B to be tied together to maximize water transfer. Clarifies refill management for tanks C and D.
  - Radiator Isolation – Mission duration requirements – change from MDF to NPLS
    - If radiator is isolated for a lead or it fails to bypass then next PLS if supply water quantities will not support to the following PLS opportunity

Flight Rules Update – Volume A

- Significant Changes (cont'd)
  - MPS Helium Leak and engine out – interconnect as soon as practical vs. waiting
  - Maximum EVA duration constraints – same as flown in STS-101 annex
  - Post-Landing SSME repositioning update based on SAIL testing and G9 code evaluation to allow repositioning with several failures that previously weren't allowed and to reflect several ops workarounds
  - Addition of COAS Nav constraints for Rdz (in event of two star tracker failures)
  - Management of EMU consumable without real-time EMU data
  - N2 Redline requirements - updates with various volume configurations (avoids flight specific rules)
  - Ground Commanding update to reflect Payload throughput buffer and generic command server
  - Deletion of TDRSS-Z rule constraints (OI-28 FSW enhance TDRSS management capability)

STS-106/ISS Increment Annex Rules

- Rules approved at JPRCB on 8/14/00
- Mission Specific Objectives/Priorities defined
- Much of the annex is similar in content to STS-101 annex. New content reflects ISS configuration with SM attached. Many of SM rules are extensions/analogs to FGB rules.
  - SM Systems and motion control – docking differences
  - Primary differences in MCS operations. (Auto moding at docking, Undocking timer (250 sec) allows orbiter to get far enough away before MCS resumes control
  - Safing of SM systems for EVA (MCS in indicator with manifolds closed, keep out zones or inhibits for antennas, SM arrays fixed)
- EVA comm rule in event of loss of comm - Requires minimum of relay comm for tasks not requiring continuous monitoring of inhibits else direct comm required
- KU Management update – ops workaround to preclude radiating inside protect box (TDRSS handovers/acquisitions)
- Cabin Temp management rule – same as STS-101

STS-106/ISS Increment Annex Rules

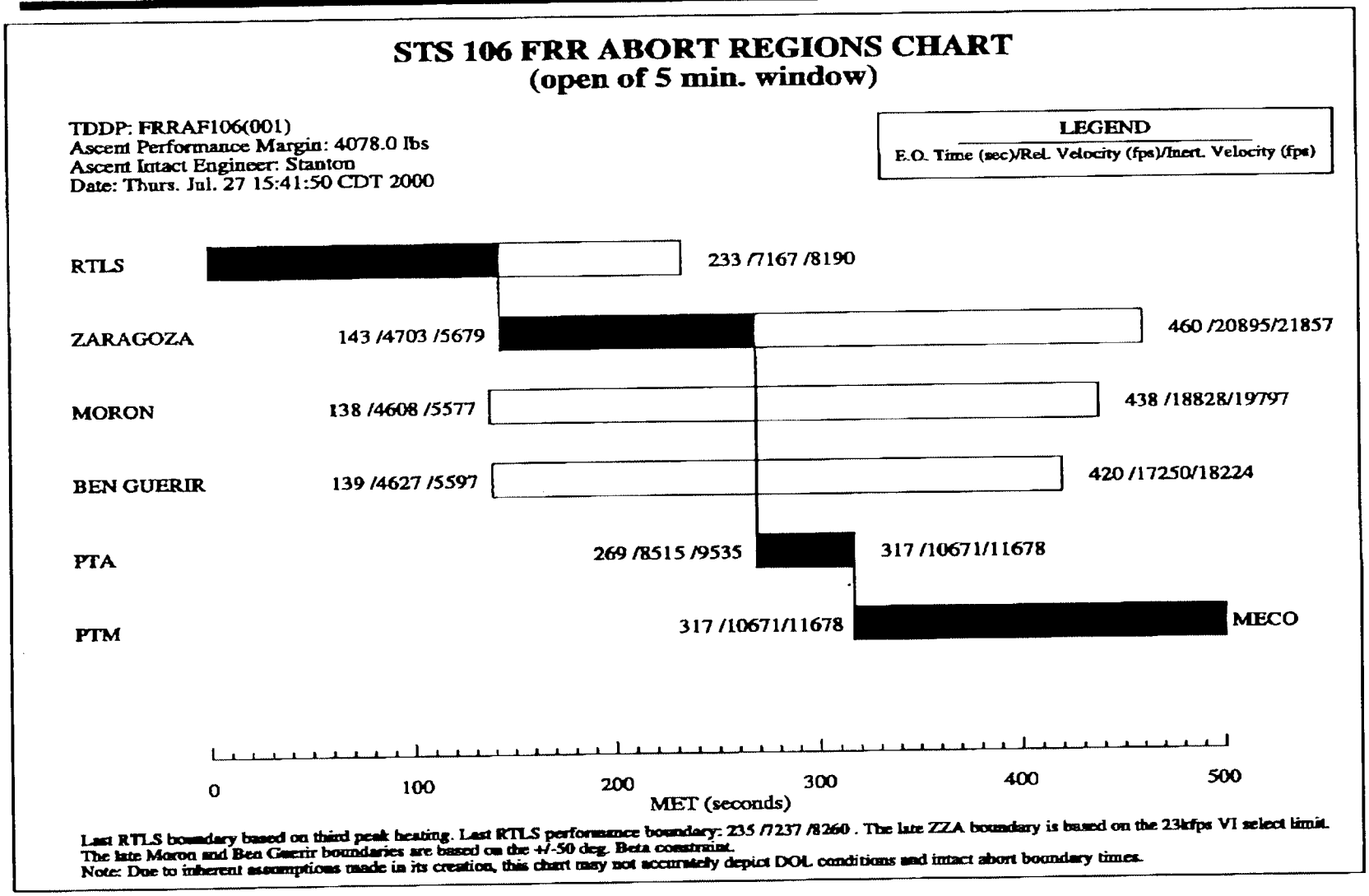
- Open Work – PCN 1
  - Approximately 20 flight rules will be added/modified with PCN-1
  - Significant changes:
    - Revised launch window rule (latest trajectory, optimum launch time strategy)
    - Updated mission priority list
    - ACS moding at docking (manual backup command 20 seconds after capture)
    - Shuttle sep and flyaround – ISS OK to maneuver during flyaround
    - Update egress configuration of ISS (pressure equalization valves)
    - Closeout of numerous minor updates/corrections/open work
  - Shuttle rule additions:
    - AC bus sensor management update
    - Revision of hydrazine decontamination/Drager tube use rules
    - Airlock EMU servicing – minor thermal limits update
  - Two rules awaiting Russian signoff (no technical issues expected)
  - Any other changes to priority list (due to requirements changes) (crew quarter unstow)

STS-106 Ascent Performance

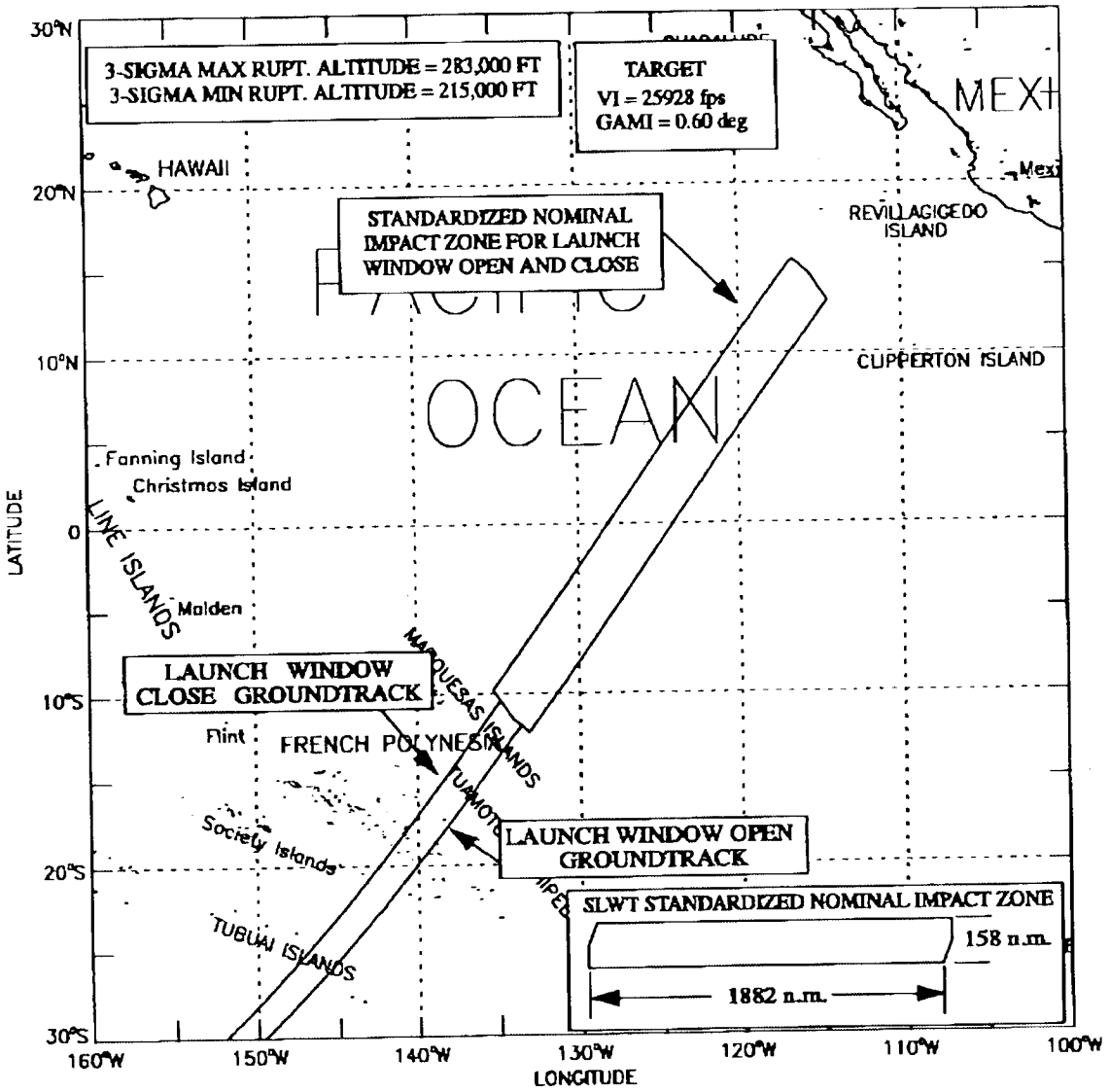
• INSERTION ALTITUDE/INCLINATION	173 NM / 51.6 DEG
• FIRST STAGE DESIGN CRITERIA	DOLILU II / OPS HIGH Q
• LAUNCH WINDOW OPEN (10 MIN)	SEPTEMBER 8, 2000
	12:40 GMT 08:40 AM EDT
• LAUNCH WINDOW CLOSE (10 MIN)	SEPTEMBER 8, 2000
	12:50 GMT 08:50 AM EDT
• LANDING TIME (KSC, DARK)	SEPT 19, 2000 4:45 AM EDT
• I-LOAD DESIGN APM*	3964 LBS
• FRR ASSESSMENT APM* (5/10 MIN WINDOW)	3785 / 2185 LBS

* NO REDUCTION DUE TO DOL DISPERSIONS; 5 MINUTE WINDOW

STS-106 Abort Regions



STS-106 Nominal ET Impact Area



STS-106 - Significant Open Work

- Completion of US/Russian JOIP and signoff
- Workout Planning Process Issues to ensure adequate exchange of planning information
- Provide procedures for removal and reinstallation of progress docking probe – FOR Action - RSC-E/Tsygankov, DO/Pruzin
- Final sign off with RSA on multi-element leak response
- US review of final RODF – in work
- Flight Rules Annex PCN

MISSION OPERATIONS DIRECTORATE
CERTIFICATE OF FLIGHT READINESS (CoFR)
FLIGHT: STS-106/2A.2b REQUIREMENTS

Critical Processors/Applications, Non-Crit Processors/Applications; Flight Rules: EMCC: Trng-MCC /POCC; FTP-New Operations; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Exception Resolution; CMD Proc; FPPP Requirements Met; Contractor Process Insight	DA8/Chief, Flight Director Office
Crit Processors/Applications; Non-Crit Processors/Applications; FDF; EMCC; TRNG-MCC/POCC; LCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; FPPP Requirements Met; Contractor Process Insight	DF/Chief, Systems Division 8/8/00
FPPP Requirements Met; Contractor Process Insight	DB/Chief, Systems Development and Operations Division
FAC-NBL; FAC-SVMF; FDF; TRNG-Crew Trng; TRNG-MCC/POCC; TRNG-EVA/MARS; LCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; EVA Hardware Integration; Contractor Process Insight	DX/Chief, EVA, Robotics, & Crew Systems Operations Division
Crit Processors/Applications; Non-Crit Processors/Applications; FDF; EMCC; RECON-Flight S/W (MMU); TRNG-MCC/POCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Level II Actions; Mission Requirements; CMD Proc; FPPP Requirements Met; Contractor Process Insight	DM/Chief, Flight Design and Dynamics Division
Crit Processors/Applications; Non-Crit Processors/Applications; FDF; FDF Manage; EMCC; PGSC; TRNG-MCC/POCC; FTP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; CMD Proc; FPPP Requirements Met; Contractor Process Insight	for L.D. Davis. DO/Chief, Operations Division
EX/AI from Prior Reviews; No Constraints; Level II Actions; Mission Requirements; FPPP Requirements Met; Contractor Process Insight	DT/Chief, Space Flight Training Division
FAC-MCC; FAC-Network Interface; FAC-SMS; FAC-SPF; FAC-IPS ; Crit Processors/Applications; Non-Crit Processors/Applications; FD-Trajectory; FD-Consumables; FD-PDRS; FD-Analyst Cert; FD-CTF; FDF Manage; EMCC; RECON-STAR/MASTII/CD ROM Products; RECON-MCC; TRNG - Crew Trng; TRNG-MCC/POCC; TRNG-SMS; FTP-New Ops; Flight Anomaly Res; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Level II Actions; Mission Requirements; Engineering Drawings; Exception Resolution; CMD Proc; FPPP Requirements Met	8/8/00 Associate Program Manager, Flight Operations, SFOC
EMCC; NETWORK; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Level II Actions; FPPP Requirements Met	8/8/00 Network Director, Shuttle, GSFC
	Mission Operations Director

MISSION OPERATIONS DIRECTORATE
ISS CERTIFICATE OF FLIGHT READINESS (CoFR)
FLIGHT/INCREMENT: STS-106/2A.2b AND SUBSEQUENT INCREMENT OPERATIONS

ISS REQUIREMENTS	
Critical Processors/Applications; Non-Crit Processors/Applications; Flight Rules; EMCC; Trng-MCC /POIC/POCC; JOP-New Operations; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Program Actions; Mission Requirements; Exception Resolution; CMD Proc; Contractor Process Insight	DA8/Chief, Flight Director Office
PCS; EX/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Contractor Process Insight	DA4/Manager, Portable Computer System Project Office
EX/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Contractor Process Insight	DD/Chief, Operations Technology Division
The SSTF maintains a training load consistent with the last training environment for the increments in progress which can, on demand be loaded and updated to the required onboard configuration for any necessary procedure development.	DK/Simulator Operations And Technology Division
Crit Processors/Applications; Non-Crit Processors/Applications; ODF/SODF; EMCC; TRNG-MCC/POIC/POCC; LCC; JOP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Program Actions; Mission Requirements; CMD Proc; EVA Hdwr; Contractor Process Insight	DF/Chief, Systems Division 8/8/00
Contractor Process Insight	DP/Chief, Systems Development and Operations Division 8/8/00
Crit Processors/Applications; Non-Crit Processors/Applications; TRNG-MCC/POIC/POCC; JOP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; CMD Proc; FD-Flight Mechanics, FD-Analyst Cert. FD-CTF	DM/Chief, Flight Design and Dynamics Division
Crit Processors/Applications; Non-Crit Processors/Applications; ODF/SODF; ODF/SODF Manage; EMCC; TRNG-MCC/POIC/POCC; JOP-New Ops; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; CIL/Hazards; No Constraints; Program Actions; Mission Requirements; CMD Proc; Contractor Process Insight	FOR L.D. DAVIS DO/Chief, Operations Division
EX/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Contractor Process Insight	DT/Chief, Space Flight Training Division
FAC-MCC; FAC-Network Interface; FAC-IPS; Crit Processors/Applications; Non-Crit Processors/Applications; ODF/SODF Fabrication; Flight Anomaly Res; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Program Actions; Mission Requirements; Exception Resolution; CMD Proc	Associate Program Manager, Flight Operations, SFOC
NETWORK; Flight Anomaly Resolution; Anomaly-Proc; Ex/AI from Prior Reviews; No Constraints; Program Actions	Network Director, SSP-ISSP, GSFC 8/8/00
	Mission Operations Director

STS-106 FLIGHT READINESS STATEMENT

THE MISSION OPERATIONS FLIGHT PREPARATION PROCESS PLAN DOCUMENTED IN NSTS 08117, REQUIREMENTS AND PROCEDURES FOR CERTIFICATION OF FLIGHT READINESS, HAVE BEEN SATISFIED. REQUIRED PRODUCTS AND OTHER RESPONSIBILITIES FOR MISSION OPERATIONS (NSTS 08117, SECTION 8, PARAGRAPH 8.5.7) HAVE BEEN OR WILL BE PRODUCED OR COMPLETED. ALL AREAS ARE READY. MISSION OPERATIONS IS PREPARED TO SIGN THE CERTIFICATE OF FLIGHT READINESS FOR STS-106.

J. W. BANTLE
MISSION OPERATIONS DIRECTOR

C. L. VERMILYEA
VICE PRESIDENT AND ASSOCIATE
PROGRAM MANAGER, FLIGHT
OPERATIONS, SPACE FLIGHT
OPERATIONS CONTRACT